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(See article "Facts About Marihuana," p. 422)

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Since 1825

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E D I T O R I A L

PHILOSOPHY OF DESTRUCTION

ONE hears and reads these days of events which defy the understanding of any intelligent person. During the war years we became accustomed to the stories of wholesale destruction. The work of centuries, the toil of untold millions were in one brief instant totally and irrevocably destroyed. Such happenings were unavoidable in a world at war and most persons accepted them, although the loss of many architectural and artistic forms of beauty were mourned and the incalculable economic waste was appalling.

With the end of the war, thinking persons everywhere breathed a sigh of relief that destruction could now end and that the world could again begin that slow and painful process of rebuilding torn and blasted cities and replanting burned and charred forests and fields. Concern indeed was felt over the realization that the world's raw resources had been severely drawn upon only for purposes of destruction and that many an oil well was dry and many a mine stripped of all save the poorest of ore.

It is indeed a conservationist's nightmare! Even many who have exploited nature for years are alarmed.

Some of our leaders, however, having been so schooled in destruction, are so lacking in understanding and adaptability that even with the war's end this policy of destruction was continued and may we ask why? No answer but ineptitude and unbelievable ignorance is possible. Just recently we read of the total destruction of some cyclotrons in Japan by the army of occupation with the scarce metal even dumped in the sea. How many universities would have mortgaged their halls to own one! A newsreel recently showed us the total destruction in one blast of a large chemical plant in Germany. Could none of this equipment be used in devastated Europe?

It is high time that our government stop such wanton destruction of equipment and facilities regardless of their location. To conserve such things is in no sense to subscribe to a "soft" peace for

the conquered nations. It is rather the simple exercise of intelligent thought if that is not too much to expect of government. The military mind has always shown complete unconcern over the difficulties which surround the manufacture and costs of material to supply their insatiable appetite and this in time of war must be endured. Now that the war is over it is high time that our top officials appreciate the fact that continued destruction of anything of value simply adds to the already staggering financial cost of the war. Even as it is, the cost will burden humanity for decades to come.

L. F. TICE.



FACTS ABOUT MARIHUANA

A Survey of the Literature

By Sol Charen, B. A., M. A.

History

CANNABIS SATIVA, commonly called hemp, has long been recognized as having an intoxicating principle in the resin of the plant. The action of hemp preparations is mentioned in some of the earliest records available and is described in the first medical treatises. In the last two thousand years over 400 articles have been published describing its intoxicating characteristics and the effects on human beings.¹

It has been known in China since the 6th century B. C. There are references to it in ancient Sanskrit literature. The earliest mention of the drug under the name "bhang" occurs in the *Atharva Veda* which dates from 2000 to 1400 B. C. although there is some doubt about the reference being to hemp.² The ancient Scythians are quoted as using it to induce a state of excitement by inhaling the vapor from burning hemp, according to Herodotus. Homer made Helen administer to Telemachus in the house of Menelaus a potion prepared from nepenthe, believed to be hemp.³ In Hindu references it is mentioned about the 6th century A. D. as "antiphlegmatic" and in the 10th century A. D. its intoxicating properties were recognized as well as its euphoric and stimulating properties. In 1500 A. D. and later, Hindu writers describe the hemp drug as being for the welfare of man and that it brought joy and removed anxiety.⁴ In Arabian and Persian medicine it is mentioned as early as 658 A. D. There are frequent references to it in the Arabian Nights under the name "Benj."⁵ It was used indiscriminately as an intoxicant in Africa and Asia from the 10th century A. D. on.⁶ The Decameron of Boccaccio (about 1353) refers to the use of what may be the hemp drug. Cannabis seed is mentioned in the New London Dispensary of 1682 as curing cough and cold "but filling the head with vapors."⁷ In 1809 Sylvester-de-Lacy and in 1810 Rouyer, both attached to Napoleon's expeditionary force in Egypt, collected much information about hemp drugs and published their

findings and observations.⁸ It was not brought to Europe in any quantity however until about 1840 when O'Shaughnessy and Aubert Roche advocated the therapeutic application of the hemp drug.⁹ It was never popular in Europe as an intoxicant because the writers of the 19th century, those who tried it for subjective analysis, gave the impression that continued use would result in deterioration or death. It was thought of as a vice common to Africa and Asia. Only in recent years has the use become widespread in Europe and it is referred to commonly as an American vice indicating the possibility that use as a narcotic was introduced by Americans.

In the United States it has become a problem only in the past twenty years, and an acute one associated with much publicity in the past ten. This despite the fact that hemp cultivation dates back to the 17th century in America.¹⁰

At present hemp plant addiction is believed to be common in India, Iraq, Palestine, Persia, Turkey, Russia, Greece, Northern, Central and South Africa, South America, Central America, Cuba, Mexico, Canada, and recently in England as well as many parts of the United States. It was believed to have been first used in New Orleans about 1910 and is now widespread in the United States.¹¹ When public conscience first became aware of it in New Orleans it was found to be a problem among school children. Walton claims a crime wave resulted in the city aggravated by the influence of the drug habit.¹²

Contentions About Marihuana

Botany: A very detailed account of the hemp plant as to description, cultivation, preparation of the drug can be found in the references by the Chopras¹³ and by Walton.¹⁴ Sufficient to state that the hemp plant *Cannabis sativa* L. is monotypic and that it grows in practically every inhabited locality in the world. The main source of the drug is the tops of the female plants during or shortly after the period of flowering.

Pharmacological Studies: Adams¹⁵ summarized much of the work done to isolate the active ingredient in marihuana and states that both chemical and pharmacological studies have been quite meager as to results. He states:

"In pharmacology there is still much to be done in cooperation with the chemist to elucidate in more detail the relationship between activity and molecular structure. With a pure chemical substance of marihuana activity it will be possible to determine experimentally what actions are exerted upon body functions other than those which have hitherto attracted attention."¹⁶

However the Chopras,¹⁷ and Loewe and Modell,¹⁸ and Walton¹⁹ have used controlled dosage on experimental animals which showed definite physiological effects, using both extract and isolated constituents of the hemp plant. Loewe and Modell²⁰ have isolated these active ingredients, *cannabidiol*, *cannabinol* and *isomeric tetrahydrocannabinols*. The first two but not the last have been obtained as crystalline substances.

Medical Studies: About 1839 in India many medical studies were made. Indian hemp was used as a sedative of the central nervous system in such diseases as tetanus, hydrophobia, rheumatism, chorea and convulsions in children. It was found to be an anodyne, hypnotic and antispasmodic next to opium. It was also found to have pain relieving qualities.²¹ The Chopras²² made a study of 1238 addicts and found the following effects on different organs:

"No apparent loss of general health	57.84%
Sallow color and anemia	12.44%
Congestion of the eyes	72.13%
Septic and congested throat	39.18%
Respiratory troubles	39.42%
Digestive troubles	29.97%
Obstinate diarrhea	6.46%
Diarrhea alternating with constipation	18.42%
Palpitation, breathlessness and involvement of cardio-vascular system, congestive heart failure with cyanosis	6.87%
Loss of weight	19.79%
Cachexia65%
General asthenia	2.34%"

Allentuck found in studying seventy-two subjects given marihuana experimentally:

"An increase in the pulse rate shortly after taking of the drug, reaching a peak in two hours and then dropping. Increase in

pulse rate was accompanied by a rise in blood pressure. Increase in blood sugar level and in basal metabolism rate quite marked in some subjects but in the majority the levels reached did not exceed high normal limits. Increase in the frequency of urination but none in the total amount of urine passed during drug action. Hunger and increase in appetite particularly for sweets. Candy and sweet drinks were used to tone down the effects of the drug. Nausea and vomiting in a number of instances, diarrhea only during psychotic episodes. Blood showed no changes in cell count, hemoglobin per cent or the urea, nitrogen, calcium and phosphorus figures. The figures for the circulation rate and vital capacity and results of phenolsulfonphthalein test for kidney function and bromsulfalein test for liver function were not different from those of the control period. Electrocardiograms showed no abnormalities which could be attributed to a direct action on the heart. In the few observations on gastric motility and secretion no evidence of marihuana actions on these was obtained.

"The positive results observed . . . were not intensified by an increase in dosage. All the effects described are known to be expressions of forms of cerebral excitation, the impulses from this being transmitted through the autonomic system. The alterations in the functions of the organs studied came from the effects of the drug on the central nervous system and are proportional to these effects. A direct action on the organs themselves was not seen." ²³

Regarding behavior of these addicts, Allentuck makes the following contentions:

"(There is) a feeling of lightness in the head with some dizziness, a sensation of floating in the air, dryness of the throat, hunger and thirst, unsteadiness and heaviness in the extremities. . . . Tremor and ataxia, dilation of the pupils and sluggishness in responsiveness to light were observed in all subjects. . . . A mixture of euphoria and apprehension was generally present. . . . If they (the subjects) were in company, restlessness, laughter and joking were commonly seen. A feeling of apprehension based on uncertainty regarding the possible effects of the drug and strengthened by any disagreeable sensa-

tions present alternated with the euphoria. . . . Erotic ideas when present took no active expression."²⁴

Psychiatric Studies: Walton states:

"In the Old World there has been a numerical preponderance of published opinions that 'hemp drug insanity' constitutes a clinical entity but those opposed are inclined to discredit any causal relationship of the drug vice and insanity. In the United States a formulated conception of hemp drug insanity is lacking."²⁵

It is the opinion of the Chopras,²⁶ in their very extensive research that:

"When used as an intoxicant and as a deliriant in large doses these drugs (hemp) impair digestion and produce nervous and mental symptoms which may bring into prominence some acquired or inherited weakness on the part of the individual."

They conclude that used moderately the drugs do not cause harm.

The conclusion of the Mayor's Committee on Marihuana²⁷ is that given the potential personality make-up and the appropriate conditions of time and environment a true psychotic state may be induced by the use of marihuana.

Strecker²⁸ states:

"Marihuana, usually smoked in cigarettes, may produce serious mental disturbances, chiefly a dangerous manic-like delirium."

This view is also supported by Allentuck and Bowman,²⁹ who believe that the drug may induce a psychosis in an unstable disorganized personality when too large a quantity is taken, but they insist a characteristic marihuana psychosis does not exist being dependent on the factors of personality and mood. Because of the fact that there are no withdrawal effects in discontinuance of marihuana they advocate its use as a substitute for drug addicts undergoing treatment.³⁰

Bouquet³¹ and Anslinger³² take sharp issue with the above two both on the relationship between use and mental disorders, and claim there are serious dangers in attempting to cure morphine and other drug addicts by substitution of marihuana.

The Chopras studied 150 Indians who used hemp in an effort to stop the use of opium or alcohol. Fifty succeeded but the rest not only failed but became also addicted to hemp drugs.³³

Psychological Studies: In the study of the Mayor's Committee on Marihuana the following conclusions are made based on various psychomotor and psychological tests:

1. Indulgence in marihuana did not appear to result in mental deterioration. Intellectual impairment was related to the amount of the drug taken and the more complex functions were more severely affected than the simpler ones.³⁴

2. The simpler psychomotor functions were not, but the more complex were affected adversely. This was true of body steadiness and hand steadiness. Auditory acuity was not affected nor was the ability to estimate short periods of time and short linear distances.³⁵

3. Majority of marihuana subjects as tested by the Rorschach method showed a lack of social ease and adroitness and seemed likely to find it difficult to make good outgoing contacts.³⁶

Subjective Studies: Nineteenth century writers furnished much of the early concepts about the effects of marihuana. These conclusions tended to be accepted as scientific although it is now believed these authors' experiences were with toxic doses.³⁷ Walton quotes various literary and scientific writers who administered the drugs to themselves and recorded their experiences. The variety of experiences showed mental states ranging from agonizing tortures to sublime exaltation.³⁸

Bromberg smoked several cigarettes and states the chief effect was an intoxication of transitory nature. He experienced a period of anxiety associated with restlessness and hyperactivity, then calmness, euphoria, talkativeness, exhilaration and a vivid sense of happiness.³⁹

Adams had four associates, all chemists, try the drug. The individual effects varied except for increased stimulation to appetite. The intoxication was described as like but in detail different from alcohol.⁴⁰

Walton further states that in experienced smokers the:

"sensations desired are pleasurable ones . . . a feeling of contentment, inner satisfaction, free play of imagination. Once this state is reached the experienced user realizes that with further smoking the pleasurable sensations will be changed to unpleasant ones and so takes care to avoid this."⁴¹

The conclusions of the Mayor's Committee on Marihuana are that the drug does not change the basic personality structure of the individual, but that it lessens inhibition and this brings out what is latent in the thoughts and emotions, but it does not evoke responses which would be alien. The drug induces a feeling of self-confidence but this is experienced in thought rather than in performance.⁴²

Crime and Sex: Bromberg in a statistical study of criminals using marihuana found little relationship between major crimes and use of cannabis.⁴³ In India a causal relationship has been established in that the hemp drugs are used by the lower classes, which is generally the group to which criminals belong. There is a class of thieving nomads who use the hemp drug to obtain courage to commit crime.⁴⁴

A popular concept is that marihuana smoking causes definite desire for sexual excesses. In India where use of the drug is popularly accepted, many young people use it with the idea of stimulating the sex appetite. The Chopras have found, however, that the only direct effect has been impotence resulting from excessive use of the drug.⁴⁵ They have this to say on the subject of sexual stimulation:

"We are inclined to believe that the alleged aphrodisiac action of hemp drugs, stimulant as well as depressant, seems to be mainly the indirect effect of the drug as a stimulant of lower centers by removing the control which the higher centers have over them. The variable sexual effects can . . . be explained by action of the drugs on the higher centers. People with low morals concentrate their thoughts on sexual pleasures and objects of sexual love, while people with religious and saintly tendencies concentrate their thoughts away from such things. The stimulant or depressant sexual effects would then appear to be purely a psychical phenomena in both the cases."⁴⁶

Marcovitz and Myers⁴⁷ as well as Charen and Perelman⁴⁸ made intensive studies of addicts in the armed forces and found that sexual satisfaction played a predominant role in life. The conclusions of the latter two authors were:

"Strong sexual desires were present with an overlay of anxiety. Marihuana was used to remove anxiety and the result was an over-emphasis on sexual pleasures on various levels of infantile sexuality."

Personality Pattern of the Addict: The literature of marihuana addiction contains little information about the personality pattern of the user. The personality studies which have been made are either anecdotal or of subjective experiences. Emphasis has been largely on medical, pharmacological or sociological aspects. It was therefore refreshing to find this contention of Marcovitz and Myers:

"A completely adequate estimate of the effects of marihuana can be obtained only from viewing it as part of an entire life pattern. The problem of marihuana addiction cannot be understood from a study of the effects on non-addicts or on persons who do not become addicts—that is on persons to whom the personality pattern of addiction is foreign. It needs to be emphasized that the problem is not the drug but the user of the drug—the addict in relation to himself and his society."⁴⁹

Charen and Perelman following out this approach found:

"The personality pattern . . . is one of strong libidinous desires resulting from early home conflict, a weak ego which identifies with an undesirable father image, and a super-ego created by the moral mother. The super-ego is unable to prevent undesirable behavior but is able to create intense anxiety. Use of marihuana removes the super-ego which in turn strengthens the ego and enables it to satisfy the libidinous desires at various levels of infantile behavior. Homosexuality is evident in many of the men (studied)."⁵⁰

BIBLIOGRAPHY

1. Adams, R.: Harvey Lectures, Harvey Society of New York, series 37, p. 168 (1942).
2. Chopra, R. N., and Chopra, G. S.: The present position of hemp drug addiction in India. *Indian J. M. Research*, 31, pp. 1-2 (1939).
3. *Ibid.*, p. 9.
4. *Ibid.*, p. 2.



5. *Ibid.*, p. 3.
6. New York (City) Mayor's Committee on marihuana. The marihuana problem in the city of New York. J. Catell Press, Lancaster, pp. 1-2 (1944).
7. Walton, R. P.: Marihuana: America's new drug problem. Philadelphia, Lippincott, pp. 17-18 (1938).
8. Chopra, *op. cit.*, p. 9.
9. Walton, *op. cit.*, pp. 17-18.
10. Mayor's Committee, *loc. cit.*
11. Walton, *op. cit.*, chapters 2 and 3.
12. *Ibid.*, chapter 3.
13. *q. v.*
14. *q. v.*
15. Adams, *op. cit.*, pp. 170-185.
16. *Ibid.*, p. 195.
17. Chopra, *passim*.
18. Mayor's Committee, *op. cit.*, pp. 149-162.
19. Walton, *op. cit.*, chapter 10.
20. Mayor's Committee, *op. cit.*, p. 219.
21. Chopra, *op. cit.*, pp. 23-25.
22. *Ibid.*, p. 75.
23. Mayor's Committee, *op. cit.*, pp. 63-64.
24. *Ibid.*, pp. 50-51.
25. Walton, *op. cit.*, p. 149.
26. Chopra, *op. cit.*, p. 101.
27. Mayor's Committee, *op. cit.*, p. 51.
28. Strecker, Edward A.: Fundamentals of Psychiatry, J. B. Lippincott Company, Philadelphia (1943), pp. 89-90.
29. Allentuck, Samuel, and Bowman, Karl M.: The psychiatric aspects of marihuana intoxication. *Am. J. Psychiatry*, 99, p. 249 (1942).
30. *Ibid.*, p. 250.
31. Bouquet, J.: Marihuana Intoxication. *J. A. M. A.*, 124, pp. 1010-1011 (1944).
32. Anslinger, H. J.: Psychiatric aspects of marihuana intoxication. *J. A. M. A.*, 121, pp. 212-213 (1943).
33. Chopra, *op. cit.*, p. 65.
34. Mayor's Committee, *op. cit.*, p. 106.
35. *Ibid.*, pp. 80-81.
36. *Ibid.*, p. 117.
37. *Ibid.*, p. 1.
38. Walton, *op. cit.*, chapter 6.
39. Bromberg, W.: Marihuana: A psychiatric study. *J. A. M. A.*, 113, pp. 4-12 (1939).
40. Adams, *op. cit.*, pp. 189-193.
41. Walton, *op. cit.*, p. 220.
42. Mayor's Committee, *op. cit.*, p. 218.
43. *Ibid.*, pp. 14-17.
44. Chopra, *op. cit.*, p. 92.
45. *Ibid.*, p. 27.
46. *Ibid.*, p. 79.
47. Marcovitz, E., and Myers, H. J.: The Marijuana Addict in the Army. *War Med.*, 6, p. 389 (Dec. 1944).
48. Charen, S., and Perelman, L.: Personality Studies of Marihuana Addicts. *Am. J. Psychiatry* (Jan. 1946).
49. Marcovitz, *op. cit.*, p. 389.
50. Charen, *op. cit.*

FAMOUS COINCIDENCES OF SCIENCE

By Dwight L. Bolinger

TREMENDOUS interest—a fascination that most of us reserve today for sports and mechanics—was the lot of scientific theory and exploration in the middle and latter thirds of the nineteenth century. Investigators in all lands were applying human leverage to the yielding stuff of nature, and it was only to be expected that here and there identical processes and formulas would be conceived or discovered by two or more scientists working far apart and unknown to each other. Earlier periods had had their rival claimants, too: the circulation of the blood, the pressure of gases, the composition of water—individuals, frequently championed by their respective compatriots (who still hotly deny that a foreigner could have been first on the ground), dispute these and other discoveries; but only as observations came to be carefully dated could one say with certainty that A preceded B, or that both made their strike simultaneously.

And if simultaneously, how are we to explain the collision of minds? It did not happen often; are the cases so few that accident is enough to account for them? Almost, but not quite. We must resort to that tenuous thing called atmosphere—science was in the air, and now and then two men were similarly inspired. Problems have a way of posing themselves so as to challenge research, and the challenge is heard and taken up by more than one. As with our leaders, who may be created out of ordinary men when the hour summons them, so with our scientists a given necessity occasionally mothers two inventors at the same time.

In the five instances that follow, the coincidence was so close as to seem more than coincidence, and to approach the miraculous. With one exception, all were within a few weeks of each other; and in that one exception, which spans a slightly wider period, not two, but three men broke the same new ground. They are from the heyday of coincidences, for nowadays improved communications and the diffusion of scientific literature make these surprises less apt to occur.

Plague, pest and Black Death! What a host of literary and historical memories these words evoke, lines from Pepys and Defoe, Biblical pictures of the curse on Egypt, visions of wholesale burials and body-burnings, of streams of panic-stricken refugees fleeing from zones of horror that outmatch any visitation of modern warfare, of populations not merely decimated but practically wiped out! For such is the black record of the Black Death, or bubonic plague—deadliest, most spectacular, and still unconquered foe of the human race, whose mortality rate in some epidemics has run as high as 80 or 90 per cent, and whose score in India alone was four hundred thousand lives a year from 1894 to 1925.

The year 1894 is a memorable one to *Bacillus pestis* for another reason—for in that year it lost its first line of defense, its anonymity. As long as a germ can work in the dark, it is comparatively safe; once the microscope has sought it out, its human victims are in a position to bring their medical resources to bear, and actually to see it squirm and die under the corrosion of their reagents. This first battle was waged and won by two men on two fronts, unbeknownst to each other—a Swiss, Alexandre Emile John Yersin, and a Japanese, Shibasaburo Kitasato. The great pandemic of 1894 was beginning in Canton, whence it was to spread over the entire East. In Saigon was the laboratory of Yersin, in Hong Kong that of Kitasato, both within reach of as many specimens of the disease as they might require. Within two months of each other, Kitasato preceding, they announced their independent discoveries of *Bacillus pestis*, the germ of the bubonic plague. In all likelihood the actual moment of discovery was almost simultaneous, for Yersin, the later of the two, took time to elaborate his results in a careful study before publishing them, while Kitasato's announcement was a bare summary.

How to photograph that dazzling blob of brilliance known as the sun was a problem that vexed astronomers long after photography had been successfully used to record the aspect of other heavenly bodies. The difficulties may be weighed when one realizes that the sun, because of its tremendous heat and enormous size, is no solid footing nor even liquid anchorage, but a seething globe of more or less transparent gas. Add to this an incandescence which is sufficient to wreck any photographic plate on any but the most infinitesimal exposure, and you perceive that any success at all had to be remark-

able. How block out some of that excess light without at the same time destroying the accuracy and definiteness of the image? And, hardest of all, how photograph an angry confusion of gases which offers no landmark, no solid background, to focus upon? It was like attempting to snapshot an angel's halo, or the aura of someone's personality.

The problem was abruptly solved in 1892 by two astronomers, George Ellery Hale in the United States and Henri Deslandres in France—and no thought nor communication, unless it was telepathic, passed between them. Here are Deslandres' own words, writing of himself some years afterward in third person: "That the H and K lines of calcium are an exception to this rule was announced simultaneously in February, 1892, by Hale and Deslandres." The "rule" was that of the inability of the spectroscope to "see" any component gas against the background of the entire sun; the two lines of calcium, however, stood out with exceptional brilliance, and by filtering out all but those lines, using the spectroscope (or spectroheliograph, as Hale developed it), it was possible to photograph the sun in the light of but one gas. As the technique was perfected other gases were likewise singled out, and today one may study the sun in the light of any one of several of its glowing parts, an inspired achievement of two geniuses whose paths did not meet until their goal was reached.

The session of the French Academy on December 24, 1877, was an exciting one. The chemist Dumas (Dumas the novelist was a member of the same body) took the floor to read a letter from Louis Paul Cailletet, written only three weeks before, announcing that Cailletet, after years of unsuccessful attempts by other physicists, had at last succeeded in liquefying oxygen—the second of his two experiments, confirming the first, had in fact been accomplished but a week before this meeting, and was reported in another note from a friend of Cailletet, addressed to Dumas.

Imagine the astonishment of the learned Academicians, when, immediately upon hearing this news from the laboratory of Cailletet, they were presented with a telegram from Geneva, dated December 22, disclosing that Raoul Pierre Pictet had performed the same feat! And while the Academy was still sitting, there came a second telegram from Pictet, sent at 4:15 P. M. on that very day, declaring

that a second experiment had confirmed the results of the first. Decades of fruitless efforts on the part of other experimenters had led many of them to call oxygen a "permanent gas"—one that could not be converted by the methods that had proved successful with other gases, viz., high pressure and low temperature—into a liquid. And the two men to whom these failures served only as a challenge to greater effort achieved success at the same time, almost on the same day, each unaware that the other was moving toward the same goal.

About 1884 William James, the great American psychologist and philosopher, hit upon the theory of emotions that has had more influence and has been more widely accepted by psychologists throughout the world than any other theory of its field. Popularly stated, it is usually expressed in these words: "We do not cry because we are sad, but we are sad because we cry." More accurately, it should read, "We both feel sad because we cry, and cry because we feel sad"—for James intended to explain both the crying and the sadness as part of a whole process, with neither directly dependent upon the other. Naturally the more sensational side of the theory, seeming to upset the classical idea of emotions as "states of mind," that the very act of weeping can have an influence toward our feeling sad, was the side that caught the attention of the public and became embalmed in the words, "We feel sad because we cry."

But James had to share the honor of his discovery. In Denmark, in 1885, and entirely independently of James, the noted physician Carl Lange published an identical formulation. In deference to their joint arrival at the same conclusion, it is known to psychology today as the James-Lange Theory of Emotions. But the cycle of discovery did not end there. Thirteen years later Alexander Sutherland, apparently without knowledge of the work of either James or Lange, published in Australia his *Origin and Growth of the Moral Instinct*, in which he propounded the same theory, worked out a few years before; but his published work came too late to entitle him to a share of the popular credit.

The discovery of the planet Neptune was accomplished not with the telescope, but with mathematical graphs and tables—by which its presence was detected and its orbit all but computed before

it was ever seen. This remarkable bit of astronomical clairvoyance was the work of two young men, an Englishman, J. C. Adams, and a Frenchman, Urbain Jean Leverrier, and is rendered all the more remarkable by the fact that their labors, leading to identical results, were carried on in their respective countries, without collaboration; indeed, each was without knowledge of the other's work until after it was complete. Only an unlucky accident prevented the Englishman from claiming full honors with the Frenchman.

Leverrier tackled in 1845 (publishing his first conclusions on November 10) a problem that had vexed astronomers for some time—the queer motion of the planet Uranus, which carried it out of the orbit that it ought, by all mathematical rights, to have had. How account for the aberration? We might assume, thought Leverrier, that there is another planet beyond Uranus, acting as a disturbing influence. On this assumption he set to work with the actual figures of Uranus' motion, calculating where that assumed planet should be to account for the precise deviation. On September 18, 1846, he sent his computations to Berlin, directing that the observatory search in such-and-such a place. The letter arrived on September 23, and that same night, with the aid of newly compiled star-charts, a previously uncharted orb was discovered. The following night it was seen to have moved—conclusive proof that the body was a planet and not a star.

But Adams had actually conceived the idea of Neptune in 1841, during the week of July 3. He attempted his first mathematical solution in 1843, and on July 29, 1846, two months before the Berlin observatory undertook the task, British astronomers were surveying the suspected area of the sky; on August 4 the astronomer Challis actually saw Neptune, but did not recognize it as a new luminary. Then came September 23, and we can picture the instruments of Cambridge and Berlin searching the heavens at the same time. But Leverrier's collaborator had the advantage of his charts, and word of his success reached Cambridge while the hunt there was still going on.

FIFTY YEARS OF X-RAYS

By George Rosengarten, Ph. D.*

IN December, 1895, just fifty years ago, the scientific world was informed of the results of research in pure science by Wilhelm Konrad Roentgen concerning a new kind of rays which have been called Roentgen Rays or more often X-rays. Roentgen was professor of physics at Wurzburg. His experiments excited interest throughout the world and within a very short time physicists in America and Europe were repeating his work, establishing both confirmation and additional information. This was undoubtedly one of the great discoveries of all time.

A few months ago we were informed in a very unusual manner concerning the release of atomic energy. For a number of years our physicists and chemists had been at work upon this problem but because of military necessity the results of their research was known only to a favored few. What the next fifty years may bring in the development of atomic energy I will not predict. We only hope that it will bring to the entire world just as great a benefit as we have experienced from a knowledge of the use of X-rays.

The Department of Physics at the College believes that this is an opportune time to review some of the outstanding results of the research and application of X-rays to our everyday life. The Philadelphia College of Pharmacy early realized the importance of this new discovery and at the Fifth Social Meeting of the Alumni Association of P. C. P. for series 1895-96 held on February 25, 1896 (about three months after discovery), invited Arthur Willis Goodspeed, Professor of Physics at the University of Pennsylvania, to speak about these X-rays and demonstrate some of their properties. The alumni reports for the above date have been consulted. Dr. Goodspeed gave a report on the experiments he had performed, including photographs of bodies invisible to the human eye and discussed the theory of the production of X-rays.

Question period followed: Mr. J. T. Shinn, "I would like to know whether the story published in daily papers recently about a

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woman having swallowed a needle and having it located in her body by X-rays was true or not."

Dr. Goodspeed's answer: "I do not know. I believe it went from Berlin to New York to Chicago and then to Philadelphia. I mean the story, not the needle." (Much laughter.)

Production of X-rays

If we send the ordinary 60-cycle 110-volt electric current through a coil of wire, the primary coil of a fairly large induction coil, we will receive from the secondary coil a current of much higher voltage. If this high voltage current is caused to pass through a vacuum tube (X-ray tube) we will have produced a stream of cathode rays consisting of negatively charged particles called electrons (not discovered until 1897) proceeding from the cathode or negative terminal and striking the other side of the tube or better a target consisting of one of the heavier metals such as platinum. The X-rays appear to originate at the target. (This was Roentgen's discovery in 1895.) From this small beginning much progress has been made leading up to the 2,000,000-volt X-ray machine developed by the General Electric Research Laboratory.

Properties of X-rays

The rays pass right through the glass wall of the X-ray tube and appear to be very penetrating passing through varying thicknesses of different kinds of matter. Their effect on the photographic plate was early observed by Roentgen; the result being in the nature of a shadow cast by the material least penetrated by the rays.

I should like to add just a personal touch by recalling a photograph showing shadows of several coins accidentally produced as early as February 22, 1890, by my former professor of physics, Dr. Goodspeed, to whom reference has already been made. While working with a Crookes tube in the laboratory some photographic plates in a box nearby became fogged and on one there appeared, upon development, the shadow picture of the coins. Later Goodspeed used to say jokingly that if he had followed up this observation we would be speaking of Goodspeed rays instead of Roentgen rays. How close some of us get to fame.

These X-rays also produce a fluorescence on a screen of barium platinocyanide as well as many other materials. Like ordinary light,

these X-rays may be reflected and refracted. Roentgen observed the difference between the cathode rays and X-rays. In his original paper he stated, "I have not succeeded, in spite of many attempts, in obtaining a deflection of X-rays by a magnet, even in very intense fields." X-rays cannot be cathode rays reflected by the target; they are produced at the target.

X-rays cause the discharge of an electrified body due to the breaking up of the air or gas surrounding the body into positively and negatively charged ions.

X-ray Theory

Theories pass through various stages. Roentgen considered the rays to be longitudinal waves since in many ways he had found that they differed from the transverse waves of light. This was soon demonstrated to be untrue and of necessity the theory must change. X-rays are very short waves (light waves) having a wave length of 10^{-8} centimeters (.00000001 cm.). The cathode rays producing the X-rays consist of electrons, the smallest particle known to man, traveling with very high velocity. When a negatively charged electron is suddenly stopped by the target it must radiate energy according to the electromagnetic theory. Each electron as it is stopped emits an "ether pulse". An electron striking a heavy atom, platinum, should produce an X-ray of greater intensity.

By passing X-rays through crystals we have been able to produce photographs showing very orderly arrangement of the atoms in the crystal spaced about 10^{-8} centimeters apart. This you can see is about the same as the wave length of the X-ray. Knowing the distance between the atoms of a crystal we can reverse this experiment and determine the wave length of the X-ray. According to the Quantum Theory, when an electron possessing kinetic energy collides with an atom of the target and is brought to rest, a quantum of X-ray energy is emitted.

Practical Application of X-rays

We shall mention only a few of the many uses for these rays during the fifty years. Perhaps most of my readers will consider the aid to the medical profession as the most important. Only a month ago I stood before the fluoroscope in the doctor's office and rejoiced

to hear him say everything looked all right. It is quite a simple matter to take an X-ray photograph of any part of the body in a very short time and have a detailed picture for further study. I need not mention how this is an aid to surgery. Our hospitals are equipped with X-ray machines used in the treatment of cancer. By giving a meal containing a barium salt the digestive system may be made visible on the photographic plate taken with X-rays. Normal voltages used in medical and surgical radiography range from 100,000 to 250,000 volts.

Dentists and shoe salesmen find use for these rays. Imitation diamonds may be detected and oil paintings examined for retouching. Swiss cheese is examined to find location and size of the holes. In the field of metallurgy the use of X-rays has been most important in the location of flaws invisible to the unaided eye. With the two-million-volt X-ray machine photographs may be made through steel plates and castings twelve inches thick and the time of exposure reduced from hours to minutes. Welded joints may be examined for soundness of the weld and steel railroad rails for flaws.

I have already referred to the passage of X-rays through crystals making possible a study of the arrangement of the atoms. This makes possible the study of the effect of high and low temperatures, effects of treatment during fabrication, strains produced during rolling, twisting, etc. X-rays are being used to study crystalline, organic compounds, colloidal and amorphous materials, rubber, cellulose and silk.

The discoverer of this most important tool for scientific research and industry, Wilhelm Konrad Roentgen, German physicist, was born March 27, 1845. He was educated in Holland and Zurich. He taught physics and mathematics and carried on research in elasticity, capillarity and piezo-electricity. It was while at Wurzburg, in Bavaria, that he discovered X-rays. He received the Rumford medal of the Royal Society in 1896 and the Nobel Prize for Physics in 1901. He died February 10, 1923.

SELECTED ABSTRACTS

Penicillin Cream. F. H. Gillett. *Pharm. J.* 101, 245 (1945).

The author recommends the following formula for the preparation of a penicillin cream which is sufficiently liquid at room temperature to be poured directly on a wound, and which does not dry and stick to the surface. The presence of the liquid paraffin appears to prevent an appreciable change in the pH of the cream as a result of autoclaving at ten pounds for one-half hour.

Lanette wax SX (3 per cent) ...	420	grains
Liquid paraffin (15 per cent)	4½	fl. oz.
Phenoxetol (2 per cent)	300	minims
Distilled water (80 per cent)	30	fl. oz.

This quantity is sufficient for 9 x 100 gm. bottles. Two per cent of phenoxetol appears to be necessary to control *Pyocyanea* contamination, against which it exerts a bacteriostatic action.

Wide-mouth, screw-capped (aluminum or bakelite caps), clear glass, 4 fl. oz. bottles are graduated at 95 mils with a file mark. The Lanette wax is heated with the water on a water bath until melted, the phenoxetol added, and the mixture is then removed from the bath. The liquid paraffin is then added and the mixture occasionally stirred until it begins to thicken; it is now transferred to the bottles up to the 95-mil mark. The preparation, after capping, is then autoclaved at ten pounds for one-half hour, being allowed to remain in the autoclave for an additional half-hour after the valve has been opened. It is then removed and shaken occasionally until it thickens.

For preparing the penicillin solution, 5 mils of pyrogen-free water are placed in 10-mil vaccine bottles, plugged with non-absorbent cotton, and autoclaved at ten pounds for one-half hour. Penicillin in tablet form (usually made to contain 8,000 or 10,000 units each, so that either five or four are used per 100 gm. bottle) is then dissolved in the sterile water contained in the vaccine bottles, and the solution added to the cream. On shaking, a homogeneous product results.

It is recommended that the work be done in a dry atmosphere, since if the air is humid the penicillin tablets will absorb moisture, stick in the container, and rapidly darken.

BOOK REVIEWS

An Introduction to Materia Medica and Pharmacology. By McGuigan and Krug. 4th Edition. C. V. Mosby Company.

While this book was written primarily for the nursing profession, it would be a valuable addition to any pharmaceutical library. It has been brought up-to-date with the U. S. P. XII, and contains, in addition, a number of well-known, and widely used, unofficial preparations.

Noteworthy are the chapters headed "Pharmaceutic Preparations" and "Weights and Measures." The latter is a complete review of most of the arithmetic problems met in pharmacy.

Included are also chapters on poisons and antidotes, biologicals, drug legislation and a glossary of medical terms.

The book is uniquely divided into units (fourteen in number) of which ten are devoted to the pharmacology of drugs as related to the various systems of the body. There are few illustrations and figures in the book, and these deal almost entirely with hospital practice; it should be remembered, however, that this was the original intent of the author. In addition, there are about twenty-five color plates picturing well-known plant drugs of special interest to pharmacognosy students.

The easy style of the book permits its escape from the rigid severity which encumbers most textbooks. The reviewer highly recommends this book as collateral reading for pharmacy students and practicing pharmacists.

J. M.

Pharmaceutical Calculations. By Bradley and Gustafson. 283 pages Lea and Febiger, 1945. Philadelphia. \$2.75.

This text was originally intended to be a revision of the third edition of the Textbook of Pharmaceutical Arithmetic* of the late Dean of the Massachusetts College of Pharmacy, Theodore J. Bradley.

The present authors recognize the difficulties in calculations encountered so often by students and have provided fully explained examples as a preface to the many types of problems included in the text. The large number of problems included in the book makes it possible for the student to test his ability since the answers have been supplied to all except the Review Problems. Together with the usual problems related to Pharmaceutical Calculations, General Chemistry and Proof Spirit, there is also included a chapter on problems as applied to Isotonic Solutions. The many types of pharmaceutical problems presented in the present edition make it a valuable text for any person confronted with the task of either reviewing or learning the many phases of calculations with which the pharmaceutical profession is confronted.

HARVEY P. FRANK.

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